Art. V.—*Some Sections illustrating the Geological Structure of the Country about Mornington.*

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(With Plate IV.)

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Previous Work.

Dr. A. R. C. Selwyn, in 1854, (**1**) gave a sketch of the geology of the Mornington Peninsula. He compares the blue clay series, both lithologically and as to fossils with the beds of the London and Hampshire basins. The basalt of the coastal sections he refers to dykes, a conclusion from which we dissent. The other formations are described and compared with those of localities outside the area under immediate discussion, a proceeding due to the fact that he was as yet only at the beginning of his work in Victoria, and a rapid examination of the Castlemaine district was almost all he had done. His coloured sections run from Cape Schanck to Mount Martha, from Hawthorn to the Salt-water River near Flemington, and a diagrammatic one illustrates the position of the gold drifts, then a much debated question. Another section, on a scale of about two miles to an inch, runs from near Mornington to the Powlett River, while another is drawn across the Yarra estuary, and is compiled from the results of borings. Finally we have another—a diagrammatic one—across the colony from the Grampians to the Alps. The coloured map shows the the whole of the eastern side of Port Phillip, from the Yarra mouth to the Heads and extending to the eastward nearly as far as Cape Patterson; the scale being two miles to an inch.

Two years later Selwyn (2) published a much fuller report on the district, accompanied by a map on the same scale, but showing greater detail. The section is instructive, but does not touch the area under consideration. It extends from near Somerton to Mount Corhanwarabul (Mount Observatory), and the distance of thirty miles was chained, levelled and drawn to true horizontal and vertical scale, the scale being six inches to a mile. In dealing with the tertiaries twenty-two genera of mollusca are mentioned as occurring in the Mornington clays.

These old reports of Selwyn's, buried as they are in a mass of Parliamentary papers, are not often referred to, but contain a large amount of interesting information. Subsequent explorations have somewhat modified, as is natural, a few of his conclusions, but they still form a safe basis on which we can build, and show how soon he gained a clear insight into the geological structure of Victoria.

Shortly after this, Dr. Selwyn (3) presented a suite of fossils from Mornington to the Royal Society of Tasmania, and the collection is described as showing a close resemblance to forms found at Table Cape.

In 1857 Sir F. M'Coy (4), in his evidence before the Coal Commission, alludes to the small area of "carboniferous deposit" near Schnapper Point, and says that all that area between the granite and the sea was found to be traversed at a little depth by a "sort of dyke" of igneous rock or trap, similar to that which occurs in the Cape Patterson beds on the coast, and similar to that found at a depth of nearly 200ft. in the two more northern borings. Dr. Selwyn, in his evidence before the same commission, said, in reference to Schnapper Point and the shores of Port Phillip Bay, "In this district 200ft. of coal strata have been bored through, and in that thickness no seam more than 3 inches thick has been discovered. If any available coal deposit exists in this neighborhood, it can only be under the waters of Port Phillip. Inland the coal strata are most undoubtedly and completely cut off by being faulted against older rock. This line of fault extends in a direct line from Frankston to Arthur's Seat, parallel to the coast; beyond the latter point, the coal rocks, if existing, are overlaid by such a thickness of newer tertiary deposits as to render them of no practical value."

Two bores were put down, Selwyn says, one near Mordialloc, and after passing through 238ft. of soft sand and clay of the tertiary series, bottomed on a very hard, dense, black rock, or basalt. The second was commenced near Frankston, on the Nine-Mile Beach, and has been carried to a depth of 172ft. Of this, 165ft. was again through clay and sand, and the last 7ft. was partly in sandstone of the old Silurian series, and the remainder again in the dark, very hard trap. Of the bore mentioned as being put down in the "coal strata," we can find no record. Subsequently to this many brief references were made to the fossils and age of the blue clays, chiefly by M'Coy, who at first called them Upper Eocene, and then, accepting the new term Oligocene as its equivalent, changed his references to the age to this.

In 1893 Messrs. Tate and Dennant (5) published a list of about 130 described species of mollusca from Mornington, and referred the beds to Eocene age ; while numerous references to the fossils and additional records occur in other papers of these authors, as well as in several of our own.

In 1900 Mr. A. E. Kitson (6) wrote a report on the geology of the district, accompanied by a map and sections. In this paper there is a large amount of detailed description of the exposed sections, and the age of the various beds is discussed, but the consideration of many interesting points is deferred.

Early in the present year Mr. E. G. Hogg published a paper (7) on our Victorian granites, in which the granite rocks of this area were described.

More than ten years ago we began paying attention to the geology of the district, and, besides collecting largely from the various outcrops, have made numerous traverses, while for many years past we have taken students over the ground and discussed the more important sections with them. The puzzling nature of several of the sections, owing to faulting and to landslips, delayed our earlier publication, but, as we believe that we can add some useful information to that already supplied by Mr. Kitson, we venture on the present paper. The scope of Mr. Kitson's communication renders it unnecessary for us to do much more than to discuss a few of the sections displayed on the coast or in the gullies, and to supply a list of the fossils known to us to occur.

Considerable confusion appears to exist as to the names of the small creeks or gullies which run down to the Bay, and we use the local names as far as we have been able to ascertain them. As a matter of fact many of them are too small to have widely recognised ones, and generally bear the name of the owner of the land through which they run, and to these facts is due the deviations which Mr. Kitson's map shows from local usage.

The Sections.

Frankston Brickyard.

In the yard of the Frankston Brick Company, south of the pier, the succession is—

Red sands, grits and white clay
Basaltic clay
Conglomerate (?)
Granite rock.

The granitic rock was reached in a well put down for water and the spoil heap appears to show the presence of the conglomerate. Considerable slipping has taken place at some spots. A shaft was put down a few years ago in search for coal at about low tide mark, slightly to the north of this spot, but all traces have now been washed away.

Sweetwater Creek.

The road cutting near the mouth of Sweetwater Creek (Naringalling Creek of Mr. Kitson) is through a landslip, but the true succession can easily be made out on the hill. We get :—

Red sands, grits and white clay
Basalt
Conglomerate
Granite rock.

In places there is considerable displacement by slipping, and apparently the whole face has come down without, however, much disturbing the order of the beds. About 25 years ago, according to Mr. B. Baxter, a local resident, a considerable fall took place, which completely blocked the traffic, and fragments of the basaltic rock are still to be seen on the beach, evidently derived from this or previous landslips.

Oliver's Point.

This is the first high cliff south of Frankston. The section shows—

Ferruginous grits and sands passing up into white sands (Eocene) - -	45 feet.
Decomposed basalt - - - -	10 ,,
Grits with overlying conglomerate - -	10 ,,
Granite [1] - - - - - -	27 ,,
Total - - - - - -	92 feet.

The ferruginous grits have not as yet yielded fossils at this locality.

Landslip Point. (Fig. 1).

The succession is the same as at Oliver's Point, and the thickness of the beds is practically the same. An interesting point about the section is the occcurrence of a band, a few inches thick, full of casts of fossils at about 20 feet above the top of the basalt, the occurrence of which was first detected by Mr. Kitson, and which was referred by Mr. Dennant to Eocene age.

The fossiliferous band is much softer than the thick-bedded, well-jointed, hard ironstone grits which underlie it, and blocks of which thickly strew the beach below. At the date of our last visit, in December of last year, pieces of the fossiliferous rock were common on the beach owing to a rockfall which took place during the winter, but owing to their soft condition they will probably soon be broken up by the hard shingle. The determination of the Eocene age of the ferruginous grits which mantle the surface of the district up to about 400 feet above the sea, is of considerable interest. Hitherto, in the absence of fossils, these beds have generally been considered as to the same age as those displayed in the Beaumaris cliffs.[2] When, however, the fossils of the two localities are compared, it will be seen that they are entirely distinct, and that those from the grits of this

1 See Hogg, E.G. (**7**).

2 The Beaumaris beds have frequently been referred to by authors as at Brighton, Cheltenham or Mordialloc. In each case the same short cliff section is meant, and the small settlement which has of late years sprung up at the spot bears the name which we use.

district show a close agreement with those of the grey clays of Balcombe's Bay, and there is little but a lithological distinction to separate them.

South of Landslip Point.

Mr. Kitson figures and describes a section running south along the coast from Landslip Point, which displays some rather puzzling features. The conclusion that we have arrived at is that the beds owe their present position entirely to landslips. At one time we were inclined to call in the agency of faulting to explain the fact that the basalt and granitite abutted against one another with a vertical wall, but recent examination shows that there is between the two igneous rocks a seam of conglomerate in the upper part of the northern occurrence. This conglomerate also overlies both granitite and basalt, and, as it is the slate conglomerate, which in all the neighbouring sections underlies the basalt, its anomolous position was commented upon by Mr. Kitson, who suggested slipping as an explanation. We are, however, inclined to go further than he does, and ascribe the position of the basalt to the same cause.

Grice's Creek. (Figs. 2 to 5).[1]

At the mouth of the creek the relations of the beds are, at first sight, not easily determined, but by observing the sequence shown in other places in the neighbourhood, become sufficiently clear. Beginning from the sea coast we find the grey, Eocene clays with limestone bands showing a high dip, the figures being, N. 5°, W. at 28°, and gradually increasing to N. 20°, W. at 58°. A few yards further and a reversal takes place, the direction and amount being, W. 10°, N. at 72°, this giving place almost immediately to the slightly lower dip of 67° in the same direction. The beds are then succeeded by basalt, which occupies the bed of the stream for nearly a chain, and over which the ascent is steep. An outcrop of granitite (?) then occurs for 30 feet, when a small patch of basalt again appears. At a height of 45 feet above sea

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1 This locality is referred to by M'Coy in his Prodromus of the Palaeontology of Victoria and elsewhere, as the Mount Eliza beds, a fact for which we are indebted to Mr. J. A. Kershaw, curator of the National Museum.

level, and about a quarter of a mile from the coast a section (Fig. 3) shows :—

Basalt - - - - - - -	5 feet.
Sands - - - - - - -	15 ,,
Conglomerate - - - - -	2 ,,
Granitic rock - - - - -	4 ,,

The dip of the conglomerate floor, on which the basalt rests, is W. 30°, N. at 10°. It is clear that the conglomerate and basalt occupy a small trough in the granitic rock, as a few yards further down the creek the base of the conglomerate rises gradually to 10 feet above the bed, while going up stream we ascend to 60 feet above the sea before we again find basalt on the floor, its base rising more rapidly than the stream bed. At about half a mile from the mouth the creek bed is 80 feet above sea level, and a good section (Fig. 4) shows a cliff of 30 feet of basalt overlying the granitic rock without the intervention of the sands and conglomerates. From this point upwards the course of the stream for some distance has a very gentle fall, granitic rock occupying the bed for the whole distance. At 90 feet above the sea the section displayed (Fig. 5) shows 15 feet of granitic rock overlain by 20 feet of a conglomerate, chiefly composed, as are the others under the basalt here, of pebbles of slate and quartzite. The surface of the granitite (?) is uneven, and, at a height of 120 feet, we find decomposed basalt in the creek bed, which is again succeeded, as we ascend the valley, by the granitic rock.

At about 180 yards from the road, and at a height of 160 feet, we reach the top of the last granitic outcrop, and between this and the road, at a height of 230 feet, we find only ferruginous grits. The top of the granitic rock is much weathered, and, as the base of the grits much resembles it, an exact line of separation cannot be drawn. The ferruginous grits, at an elevation of 190 feet, have yielded obscure plant remains.

South of Grice's Creek.

On passing southwards from the mouth of Grice's Creek we find the Marine Eocene dipping south at about 25°, but a change of direction to the north soon takes place, and the calcareous bands can be seen striking out to sea in a westerly direction along the beach floor. We then find basalt, and under it on the beach olive shales with Angiopteridium spathulatum (syn. Taeniopteris daintreei) and Thinnfeldia odontopteroides. Abutting on these Jurassic beds is the granitic rock, capped and masked by ferruginous sands. The fact that the Jurassic series owes its position to being faulted down against the plutonic rock was, as mentioned above, long ago stated by Selwyn, and a mile and a half inland the latter rock still rises to a height of over 500 feet.

Balcombe's Bay.

Near the northern end of the shallow indentation known as Balcombe's Bay is the well-known fossiliferous outcrop of Eocene clays and limestones.[1]

The limestone strings and bands were formerly used for making cement, and the ruins of the works are still to be seen. As is shown by the limestone bands, the clays are somewhat disturbed; in one place, north of the cement works, the dip is—E., 25° N, at 16°, but changes rapidly in amount and direction, and occasional sigmoidal curvature of the outcrop, shows the existence of slight contortion, with a dip of from 15° to 20°. Close to the cement works, the beds dip steadily towards the south-west. If this dip held, they would pass under the extension of the basalt which forms the base of the small point to the south; but, judging by what we see elsewhere, they do not.

On rounding this point, the character of the beds is entirely changed, and from sea level to a few feet above high-water mark, we find grits and light conglomerates, with pebbles of quartz and slate, and interspersed with bands of lignite and carbonised tree-trunks. Dicotyledonous leaves are plentiful, and no trace of Jurassic plants is to be seen. The strata are fairly horizontal, but current-bedded. Over these beds, and not apparently separable by an unconformity from them, occurs a series of strata of different character. These are lavender-coloured and yellow sandy clays, with a considerable amount of gypsum and copia-

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1 Like many of our longer known geological localities, which were found when geographical names were not so thickly scattered as they are now, this outcrop is known by many designations, such as Schnapper Point, Mornington, Mount Martha, or even Hobson's Bay, though the Bay is thirty miles away. Probably "near the mouth of the River Yarra" also refers to this spot, and was near enough when it was written.

pite (?). We have never been able to find any undoubted fossils in the cliffs about here, though we have frequently searched for them. The general appearance and character of the beds resembles that of the marine Eocenes at various localities, and the amount of gypsum present suggests its derivation from calcareous organisms. We see no reason why these beds should not be classed with the blue clays which, in all probability, they succeeded. About a quarter of a mile south of the point mentioned above, and at which the lignitic conglomerates appear, we find another peculiar section (Fig. 6). The grits and conglomerates can be traced passing under a small mass of basalt, which shows well-developed tabular jointing. The base of the basalt, where it rests on the underlying beds, is vesicular, or rather, amygdaloidal, and becomes denser as we ascend. It abuts against the cliff, which is formed of variegated sands and clays, passing up into ferruginous beds near the top of the cliff. The actual junction of the basalt with the undisturbed strata of the cliff is masked, but the beds can be readily traced along the cliff to the northward, where, as we just stated, they overlie the lignitic series, with no clear break, and without any trace of the basalt being intercalated between them. In fact, there is no basalt shown along the cliffs, though a couple of islets and a small patch visible on the beach at low water connect the two points, which are preserved by their basaltic sea-fronts. The fact that the lignitic beds underlie the basalt, and can be traced horizontally till they underlie the gypsiferous sandy clays to the north, puts faulting out of the question, though, at first sight, the nearly straight line which the shoreward edge of the basalt shows suggests it. There remain two other possible explanations of the section. One is that we are dealing with a narrow flow of lava which has passed down an eroded valley which cut through the upper sandy beds till the lignitic series was reached.

The objections to this view are, firstly, that the cliff above the tabular basalt rises steeply, and the bedding is distinct and fairly horizontal, and we cannot suppose such a valley-wall to have persisted in incoherent material from the time when the basalt was poured out, for the basalt precedes the blue Eocene clays with fossils. The other objection is that if, as we suppose, the sandy beds represent the marine eocene, then they should be subsequent to the basalt.

The alternative explanation is that there really was a considerable lapse of time between the deposition of the lignitic series and the overlying beds, and that the basalt represents a denuded portion of a sheet which has almost entirely disappeared, and that, after its partial removal, the sandy beds were laid down, partly on the lignitic series and partly on the basalt. The passage of the beds in this case would be only apparent, and due to the fact that the first-formed portion of the upper beds was derived from the waste of the lower. This explanation is the one we adopt.

Succession of the Rocks.

We give the following as, in our opinion, the sequence of the beds :—

Bleached sands, clays and alluvium - -	Eocene to Recent.
Ferruginous grits, sands and clays - -	Eocene.
Blue and grey clays and gypsiferous sands	
Basalt - - - - - - -	
Slaty conglomerate and lignitic beds -	? Eocene.
Shales and sandstones - - - -	Jurassic.
Granitic rocks.	
Slates, &c. - - - - - - -	? Silurian or Ordovician.

Silurian or Ordovician?

The series of highly-inclined rocks is clearly antecedent to the granitic rock, as small dykes and sills of the latter occur in the Moorooduc quarry. Hitherto we have been unable to find any fossils in these rocks *in situ*. The coarse conglomerate which underlies the basalt in many places appears to be, in the main, derived from the older paleozoic sedimentary rocks of the district and from the granitic series. In two places, namely, in the first cutting on the coast road south of Frankston, and near the first outcrop of granitic rock south again from this place, on the shore we have found a few graptolites in slate pebbles. They are very indistinct, and, beyond saying that they are species of Diplograptus, we do not at present care to venture. Their evidence, then, leaves the age of the rocks still open.

Granitic Rocks.

Mr. E. G. Hogg, as already mentioned, has described some of these rocks, and calls the Frankston ones granitites and the Mount Martha ones syenites, hornblende being present.

Jurassic.

The presence of Angiopteridium spathulatum and Thinnfeldia odontopteroides at the outcrop on the beach south of Grice's Creek appears to correlate these beds with those of Bellarine, which are exposed less than twenty miles off, across Port Phillip Bay. These are generally referred to Jurassic age.

The occurrence of faulting to account for the present position of the beds has already been referred to, and no other outcrop of the series is known in the area with which we are dealing.

Slaty Conglomerate and Lignitic Series.

The character of the conglomerates and sands underlying the basalt has been described in detail by Mr. Kitson, and there is little to add to it.

The lignitic series, or leaf beds, exposed to the south of the blue, marine, fossiliferous clays of Balcombe's Bay are of a similar character. Fragments of slate and indurated sandstone, quartz, both black and white, and sand of granitic origin are equally in evidence in the two sets of strata, and, as we have shown, the lignitic beds pass beneath the vesicular base of the basalt. For these reasons we regard the lignites and conglomerates as of the same age. The thick sheets of leaves contain many that are clearly dicotyledonous, while small fruits or seeds are not uncommon ; but, so far, nothing has been done with them. It would appear, from the sections displayed in Grice's Creek, that considerable denudation had taken place in these beds before the outpouring of the basalt, for we find them in some places forming a thick deposit of conglomerate and sand. In other places, again, and that in close proximity, they are only a few inches thick, or even may be absent, and in that case we find the basalt reposing directly on the granitic rock. The basalt itself was also much denuded before the subsidence which resulted in the deposition of the marine series upon it. It is, of course, possible that, as the basalt flowed over the uneven surface of the ground, some localities were left uncovered, and the denudation may be more apparent than real, and that absence of the rock does not imply removal. There is no evidence, for instance, that it ever covered Mount Eliza, which is about 500 feet high, and the probability is that it merely flowed round it, and sent prolongations up the valleys. In one instance, however, we have described what we believe to be a clear instance of denudation of the basalt before the deposition of the marine Eocene, and this is where we described it as overlying the lignites in Balcombe's Bay.

These periods of denudation clearly indicate a lapse of time, and, in the absence of critical palæontological evidence, the age of the conglomerates must be left undecided, for we are, as yet, unable to estimate the time which elapsed between their deposition and that of the marine Eocene. They may be Eocene or they may be Cretaceous, though in our table we class them as Eocene, but with hesitation.

Basalt.

No petrological examination of the basaltic rock has yet been made, so that its exact nature is still uncertain. The basalt is probably of Eocene age.

Blue Clays, &c.

The exact relation of the blue clays to the gypsiferous sandy clays which lie to the south of the cement works is not quite clear. These latter beds pass up into the ferruginous strata which cap the cliffs, whereas the line of demarcation between the ferruginous beds and the blue or yellow clays with fossils is, as a rule, sharp, and, till we examined the fossils of Landslip Point, we were of the opinion that they are of different ages. It seems advisable to regard the beds as mere local modifications of sedimentation, the oxidised condition of the iron being due to greater porosity of the sands. What applies to the ferruginous sands applies with equal force to the gypsiferous sandy clays. In fact, there seems to be some evidence that these do actually overlie the blue clay in Balcombe Bay, for just north of the cement works gypsiferous sands, of a very similar appearance to those to the south, occur, and, like the beds to the south, are almost, if not entirely, without fossils. It is unfortunate that just at this critical spot, where so much that is of interest could be settled, the whole cliff-face should be scarred with grass and scrub-covered landslips. Possibly the clays were deposited in a spot sheltered from the inroads of sand by a basaltic reef or ridge.

At Grice's Creek, again, there is some difficulty in determining the succession. The blue or grey clays, rich in marine fauna, here dip at a high angle towards the basalt, and then at a still higher angle off it, and upstream the igneous rock rises some distance above sea level, while the base of the clays is hidden below sea level at the Creek mouth. It is evident that we are dealing either with a fault or with a landslip. Close at hand the fault which lets down the mesozoic rock to sea level runs parallel with the coast-line, so that, at first sight, step-faulting might be called to our aid in seeking an explanation. But if the main fault were post-Eocene, we should expect to find some traces of the Jurassics on the upthrow side. But the clear gully section shows no trace of them, so that the presumption is that they were denuded before the Eocenes were laid down, or, in other words, that the faulting did not take place in post-Eocene times. Besides this, the amount of disturbance in the marine Eocene seems to suggest the absence of a great thickness of cover when the movement took place, and to suggest a superficial disturbance rather than a fault. The cliffs in the neighbourhood are much masked, and at present there are not the necessary outcrops to test the question fully. According to our view, then, the present relations of the basalt and the marine clays at Grice's Creek are due merely to landslips, and here, as elsewhere, the clays are younger than the basalt.

Ferruginous Grits.

Ferruginous sands and clays mantle over a great part of the area, and their age is shown to be Eocene by the fossils obtained at Landslip Point. It is, of course, quite within the bounds of possibility that future investigation may show that some of the beds are younger than this; but, in the meantime, we seem justified in referring the ferruginous grits of this district all to the one age.

The character of the beds has been described sufficiently fully by Mr. Kitson, and though, for convenience, we call the beds ferruginous, yet the superficial portions, as is usual in such strata, are bleached more or less completely, and much of the district is covered by a sandy loam.

Post-Eocene.

Since the surface does not seem to have been submerged since Eocene or, possibly, Miocene times, the classification of the subaerially-formed beds is an academic rather than a practical one. The valleys are mostly short and steep on the western slopes, so that any recent alluvium is of small extent. Towards the west and north the low-lying ground is often swampy, and here the beds are of recent age. Mr. Kitson has arrived at the same conclusion, and is content to map a large area as "Eocene ? to Holocene," and his map is of great use to anyone wishing to further explore the locality.

It is clear that the western boundary, facing Port Phillip, owes its abrupt rise in the main to the fault which let down the Jurassic freshwater beds. Whether the eastern side of the long, narrow ridge, of which Mount Eliza forms the granitic nucleus, is due to the same cause is not so evident, though quite possible. The descent of the surface is more gradual, except about Moorooduc, and here a small creek, flowing south to enter the sea at Mount Martha, working along the strike of the eastward-dipping palæozoic beds is evidently the cause of the scarp.

The absence of clear sections in many of the critical localities, and the difficulty of interpreting many of the exposures, is due, we believe, to extensive landslips of the soft tertiary beds down the steep western slope towards the Bay. Had the questions involved in a discussion of the geology of this area been easy of solution, an adequate account would long ago have been written. As it is, our interpretation of some of the points at issue may not be the correct one, but it is better to have some definite basis for future work.

We have to thank Messrs. J. A. Kershaw, F. E. Grant, and E. O. Thiele for the gift or loan of fossils which have added several important forms to our list.

LIST OF FOSSILS.

NOTE.—In this list Mornington means the cement works section, and Frankston the ferruginous beds at Landslip Point, and all the identifications it contains have been checked by ourselves.

	Mornington.	Grice's Creek.	Frankston.
LAMELLIBRANCHIATA.—			
Ostrea hyotis, Linnaeus	X		
Dimya dissimilis, Tate	X	X	
Placunanomia sella, Tate	X		X
Pecten murrayanus, Tate	X	X	
,, dichotomalis, Tate	X	X	X
,, sturtianus, Tate	X	X	
,, yahliensis, T. Woods	X	X	
,, foulcheri, T. Woods	X		
,, lucens, Tate	-	X	
Amusium zitteli, Hutton	X	X	X
Lima bassii, T. Woods	X	X	X
,, linguliformis, Tate	X		X
Limatula jeffreysiana, Tate	X	X	
Limea transenna, Tate	X	X	
Spondylus pseudoradula, McCoy	X	X	X
Philobrya bernardi, Tate	X	-	-
Septifer fenestratus, Tate	X	X	X
Modiola praerupta, Pritchard	X	-	-
Modiolaria singularis, Tate	X	-	
,, balcombei, Pritchard	X	-	
Crenella globularis, Tate	X	-	
Nucula tenisoni, Pritchard	X	X	X
,, atkinsoni, Johnston	X		
,, morundiana, Tate	X		
Leda obolella, Tate	X	X	
,, huttoni, T. Woods	X	X	
,, apiculata, Tate	X	X	
,, acuticauda, Pritchard	X	X	
,, vagans, Tate	X	X	X
,, praelonga, Tate	X	-	
,, leptorhyncha, Tate	X	-	
Poroleda lanceolata, Tate	-	X	

	Mornington.	Grice's Creek.	Frankston.
Limopsis belcheri, Adams & Reeve	X	X	
,, morningtonensis, Pritchard	X	X	
Glycymeris cainozoicus, T. Woods	X		
,, laticostatus, Quoy & Gaimard	X	X	X
Arca capulopsis, Pritchard	-	X	-
Barbatia crustata, Tate	X	X	
,, celleporacea, Tate	X	X	X
,, simulans, Tate	X	X	
Plagiarca cainozoica, Tate	X	X	
Cucullaea corioensis, McCoy	X	X	X
Trigonia tubulifera, Tate	X	X	
Crassatellites communis, Tate	X	X	
,, dennanti, Tate	X	X	
Mytilicardia alata, Tate	X	X	
Cardita polynema, Tate	X	X	
,, delicatula, Tate	X	X	X
,, scabrosa, Tate	X	X	
Carditella regularis, Pritchard	X	X	
Diplodonta subquadrata, Tate	X	X	
Chama lamellifera, T. Woods	X	X	X
Verticordia excavata, Pritchard	X	-	-
Cardium hemimeris, Tate	X	X	X
,, cuculloides, Tate	X		
Chione cainozoica, T. Woods	X	X	X
Meretrix eburnea, Tate	X	X	
,, tenuis, Tate	-	X	
Tellina cainozoica, T. Woods	-	X	
Psammobia aequalis, Tate	X	-	
Semele vesiculosa, Tate	X	X	
,, krauseana, Tate	X	X	
Hemimactra howchiniana, Tate	X	-	
Myodora tenuilirata, Tate	X	X	
Myochama trapezia, Pritchard	X	X	
Corbula ephamilla, Tate	X	X	
,, pixidata, Tate	X	X	X
Cuspidaria subrostrata, Tate	X	-	
Saxicava arctica, Linn.	-	X	
Capistrocardia fragilis, Tate	X	X	
GASTROPODA.—			
Murex velificus, Tate	X	X	

	Mornington.	Grice's Creek.	Frankston.
Murex rhysus, Tate	X		
,, eyrei, T. Woods	X	X	
,, amblyceras, Tate	X	X	
,, lophoessus, Tate	X	X	
,, hamiltonensis, Tate	X	X	
,, wallacei, Pritchard	X	X	
,, trochispira, Tate	X	X	
Muricidea camplytropis, Tate	X	X	
,, asperulus, Tate	X	X	
,, polyphyllus, Tate	X	X	
*Typhis disjunctus, Tate	X		
,, acanthopterus, Tate	X	X	
,, laciniatus, Tate	X	X	
Trophon didymus, Tate (Murex)	X	X	
Rapana aculeata, Tate	X	X	
Concholepas antiquata, Tate	X	-	
Argobuccinum maccoyi, Pritchard	X	X	X
Lotorium gibbum, Tate	X	X	
,, cyphum, Tate	X		
,, woodsi, Tate	X	X	
,, textile, Tate	X	X	
,, tortirostre, Tate	X	X	X
,, tumulosum, Tate	X		
,, protensum, Tate	X	X	
,, annectans, Tate	X	X	
,, pratti, T. Woods	X		
Colubraria tenuicostata, T. Woods	X	X	
,, turrita, Tate	X	X	
,, texturata, Tate	X	X	
Fusus dictyotis, Tate	X	X	
,, simulans, Tate	X		
,, senticosus, Tate	X	X	
Clavella bulbodes, Tate	X	X	
Latirofusus aciformis, Tate	X		
,, exilis, Tate	X	X	
,, hexagonalis, Tate	X	X	
Siphonalia longirostris, Tate	X	X	
,, tatei, Cossmann	X		

* Typhis maccoyi, T. Woods, I have collected from the Eocene deposits of the next creek nearer to Frankston than Grice's, but have not hitherto seen even a fragment from Mornington or Grice's Creek.—G. B. P.

	Mornington.	Grice's Creek.	Frankston.
Siphonalia styliformis, T. Woods	X	X	
Tritonofusus crebrigranosus, Tate	X		
Solutofusus carinatus, Pritchard	X	X	
Fasciolaria cryptoploca, Tate	X	X	
,, decipiens, Tate	X	X	
,, concinna, Tate	X		
,, cristata, Tate	X	X	
,, rugata, Tate	X		
,, lamellifera, Tate	X		
,, tenisoni, T. Woods	X ?		
Latirus linteus, Tate	X	X	
,, murrayanus, Tate	-	X	
,, succinctus, T. Woods	X	X	
,, interlineatus, Tate	-	X	
,, subundulosus, Tate	-	X	
Euthria ino, T. Woods	X	X	
,, cingulata, Tate	X	X	
Leucozonia micronema, Tate	X		
,, staminea, Tate	X		
,, tumida, Tate	X		
Eburna aulocoessa, Tate	-	X	
Zemira praecursoria, Tate	-	X	
Phos tardicrescens, Tate	X	X	
Loxotaphrus variciferus, Tate	X	X	
Nassa tatei, T. Woods	X	X	X
Voluta hannafordi, McCoy	X	X	
,, macdonaldi, Tate	X		
,, ancilloides, Tate	X	X	
,, hamiltonensis, Pritchard	-	X	
,, maccoyi, T. Woods	X	X	
,, ellipsoidea, Tate	-	X	
,, sarissa, Tate	X	X	
,, pseudolirata, Tate	X	X	
,, antiscalaris, McCoy	X	X	
,, strophodon, McCoy	X	X	
,, weldii, T. Woods	X	X	
,, crassilabrum, Tate	X	-	
Volutoconus limbatus, Tate	X	X	
,, conoidea, Tate	-	X	
Lyria harpularia, Tate	X	X	X
Mitra alokiza, T. Woods	X	X	

———	Mornington.	Grice's Creek.	Frankston.
Mitra uniplica, Tate - - - -	X		
,, paucicostata, Tate - - - -	X		
,, leptalea, Tate - - - -	X	X	
,, semilaevis, Tate - - - -	X	X	
,, conoidalis, Tate - - - -	X	X	
,, atractoides, Tate - - - -	-	X	
Conomitra ligata, Tate - - - -	X	X	
,, othone, T. Woods - - -	X	X	
Marginella propinqua, Tate - - -	X	X	X
,, inermis, Tate - - - -	X	X	
,, micula, Tate - - - -	X	X	
,, wentworthi, T. Woods - -	X	X	X
,, winteri, Tate - - - -	X		
Ancilla semilaevis, T. Woods - - -	X	X	
,, pseudaustralis, Tate - - -	X	X	
Harpa pulligera, Tate - - - -	X	X	
,, spirata, Tate - - - - -	X		
,, lamellifera, Tate - - - -	X		
,, tenuis, Tate - - - - -	X	X	
Columbella funiculata, T. Woods - -	X		
,, crebricostata, T. Woods - -	X	X	
,, cainozoica, T. Woods - -	X		
,, (?) semicostatus, T. Woods -	X	X	
Cancellaria varicifera, T. Woods - -	X	X	
,, laticostata, T. Woods - -	X	X	
,, exaltata, Tate - - -	X	X	
,, caperata, Tate - - -	X		
,, calvulata, Tate - - -	X		
,, gradata, Tate - - - -	X	X	
Terebra platyspira, Tate - - - -	X	X	
Pleurotoma salebrosa, Harris - - -	X		
,, trilirata, Harris - - -	X	X	X ?
,, septemlirata, Harris - -	-	X	
,, optata, Harris - - -	X	X	
,, clarae, T. Woods - - -	X	X	
,, murndaliana, T. Woods - -	X	X	
Bathytoma rhomboidalis, T. Woods - -	X	X	X
,, decomposita, Tate - - -	X ?	X	
Drillia integra, T. Woods - - -	X ?		
,, vixumbilicata, Harris - - -		X	
,, oblongula, Harris - - - -	X	X	

	Mornington.	Grice's Creek.	Frankston.
Asthenotoma consutilis, T. Woods	X		
Cordiera conospira, Tate	X		
Clathurella bidens, T. Woods	X	X	
,, obdita, Harris	X	X	
Buchozia hemiothone, T. Woods	X	X	
Mitromorpha daphnelloides, T. Woods	X		
Daphnella tenuisculpta, T. Woods	X		
Teleochilus gracillimum, T. Woods	X	X	X
Bela sculptilis, Tate	-	X	-
Columbarium acanthostephes, Tate	X	X	
,, foliaceum, Tate	X	X	
,, craspedotum, Tate	X	X	
Conus cuspidatus, Tate	X	X	X
,, complicatus, Tate	X	-	
,, pullulescens, T. Woods	X	-	
,, ligatus, Tate	X	X	
,, heterospira, Tate	X	X	
,, ralphi, T. Woods	X	-	
,, acrotholoides, Tate	X	-	
,, dennanti, Tate	X	X	
,, hamiltonensis, Tate	X ?	X	
Cypraea gigas, McCoy	X	X	
,, gastroplax, McCoy	X	-	-
,, platypyga, McCoy	X	-	
,, leptorhyncha, McCoy	X	X	
,, ampullacea, Tate	X	-	
,, eximia, McCoy	X	X	
,, contusa, McCoy	X	X	
,, pyrulata, Tate	X	X	
,, subpyrulata, Tate	X	X	X
,, brachypyga, Tate	X	X	
,, murraviana, Tate	X	X	
,, subsidua, Tate	-	X	
,, scalena, Tate	X	-	
,, dorsata, Tate	X	-	
Trivia avellanoides, McCoy	X	X	X
Erato minor, Tate	X		
,, morningtonensis, Tate	X	X	
,, australis, Tate	X		
Semicassis sufflata, T. Woods	X	X	
Morio gradata, Tate	X	X	

	Mornington.	Grice's Creek.	Frankston.
Natica hamiltonensis, T. Woods	X	X	X
,, subnoae, Tate	-	X	
,, perspectiva, Tate	X	X	
,, polita, T. Woods	X	X	
,, limata, Tate	X	X	
,, subinfundibulum, Tate	X	X	
Calyptraea undulata, Tate	X	X	
Crepidula unguiformis, Lamarck	X	X	
,, dubitabilis, Tate	X	-	-
Xenophora tatei, Cossmann	X	-	-
Solarium acutum, T. Woods	X	X	X
Heliacus wannonensis, T. Woods	X	-	-
Scala foliosa, Tate	X		
,, transenna, Tate	X		
,, pleiophylla, Tate	X		
Crossea princeps, Tate	X		
Turritella platyspira, T. Woods	X	X	
,, conspicabilis, Tate	X	X	
,, aericula, Tate	X	X	
,, murrayana, Tate	X	X	X
Tenagodes occlusus, T. Woods	X	X	X
Thylacodes conohelix, T. Woods	X	X	
,, cratericulus, Tate	X		
,, asper, Tate	X		
Eulima danae, T. Woods	X	X	
,, acutispira, T. Woods	X	X	
Niso psila, T. Woods	X	X	
Chileutomia subvaricosa, Tate & Cossmann	X	-	
Mathilda transenna, T. Woods	X	X	
Streblorhampus obesus, Tate & Cossmann	X		
Cerithium apheles, T. Woods	X	X	
Newtoniella cribarioides, T. Woods	X	X	
,, eusmilia, T. Woods	X	-	
Colina apicilirata, Tate	X	X	
Triforis wilkinsoni, T. Woods	X	X	
,, sulcata, T. Woods	X	X	
,, planata, T. Woods	X		
Liotia roblini, R. M. Johnston	X	X	
Delphinula aster, T. Woods	X	X	
Fissurellidaea malleata, Tate	X		
Subemarginula occlusa, Tate	X	X	

——	Mornington.	Grice's Creek.	Frankston.
Emarginula wannonensis, Harris - -	X	X	
Scaphander tenuis, Harris - - -	X	X	X
Ringicula tatei, Cossmann - - -	X		
,, tenuilirata, Cossmann - -	X		
Bulinella altiplica, Cossmann - - -	X	X	
,, aratula, Cossmann - - -	X	X	
,, infundibulata, Cossmann - -	X	X	
,, exigua, T. Woods - - -	-	X	
Roxania scrobiculata, Tate & Cossmann -	X	X	
Semiactaeon microplocus, Cossmann - -	X		
Umbraculum australe, Harris - - -	X		
Limacina tertiaria, Tate - - - -	X		
Styliola rangiana, Tate - - - -	X		
Vaginella eligmostoma, Tate - - -	X	X	X
SCAPHOPODA.—			
Dentalium aratum, Tate - - - -	X	X	X
,, mantelli, Zittel - - -	X	X	
,, subfissura, Tate - - -	X	X	
,, lacteum, Deshayes - - -	X	X	
CEPHALOPODA.—			
Aturia australis, McCoy - - - -	X		

SUMMARY.

Mornington - - -	271 species
Grice's Creek - -	207 ,,
Frankston - - -	36 ,,

LITERATURE.

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EXPLANATION OF PLATE IV.

NOTE—The Scale is 1in.=50ft.

1. Section at Landslip Point.
2. Section at Grice's Creek. The line representing the surface is the creek bed.
3. Section in Grice's Creek, at 45ft. above the sea.
4. Section in Grice's Creek, at 80ft. above the sea.
5. Section in Grice's Creek, at 90ft. above the sea.
6. Section at Point, a quarter of a mile S. of the Cement Works, at Balcombe's Bay.

END OF VOL. XIV., PART I.

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